

PATENT SPECIFICATION

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COMPLETE SPECIFICATION

Motor Vehicle Combined Disc and Hand Brake

We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 1, Albany Street, London, N.W.1, and HENRY JAMES BUTLER, a British Subject, of the Dunlop 5 Rim and Wheel Company Limited, Foleshill, Coventry, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to 10 be particularly described in and by the following statement:—

This invention relates to hand-brakes for vehicles, and more particularly to hand brakes for road vehicles fitted with 15 disc-type brakes.

It is a requirement for motor vehicles that at least one pair of wheels shall be provided with mechanically applied brakes which are independent of the normal 20 hydraulic braking system. Such brakes are normally operated through a hand-lever and cable or linkage, and means are provided whereby the brakes can be maintained in the applied position 25 when the vehicle is stationary and unattended. The hand brake may also be applied as an alternative to the normal hydraulic braking system, should the said system fail during service or complementary to said system to augment 30 the braking effort.

Present hand-brake arrangements are satisfactory when applied to the conventional drum brake, but cannot easily be 35 applied to disc brakes, for instance disc brakes comprising a disc rotatable with a wheel, a non-rotatable housing straddling a part only of the outer periphery of said disc, pads of friction 40 material to frictionally engage the radially-extending sides of the disc and a plurality of fluid pressure operated piston and cylinder mechanisms to effect said engagement. Such a disc brake is more 45 fully described in our co-pending Application No. 1908/50 (Patent Specification No. 688,382).

The object of the present invention is to provide a hand-brake arrangement suitable for motor-vehicle brakes of the disc type.

According to the present invention a hand brake for a vehicle disc brake comprises a brake disc rotatable with a wheel, non-rotatable friction material to frictionally engage the periphery of said disc 55 and manual means for effecting said engagement.

The friction material may comprise a strip of flexible friction material and be secured to the inside of a flexible band which has one end anchored securely to the non-rotatable housing and the other end associated with a toggle arrangement also secured to the housing. The band 65 and strip of friction material encircle the outer periphery of the disc, the friction material lying adjacent said periphery and the construction is such that operation of the toggle arrangement tensions 70 the band to force the friction strip into frictional engagement with the periphery of the disc, and so brake the wheel. Alternatively a pad of friction material may be attached to a shoe which is pivotably secured to the non-rotatable housing 75 and a lever and cam mechanism is employed to angularly move the shoe and to force the friction pad into contact with the outer periphery of the disc. 80

In order that the invention may be more fully described reference is made to the accompanying drawings, of which:—

Fig. 1 shows a disc brake for a motor vehicle provided with a hand brake constructed in accordance with one embodiment of the invention. 85

Fig. 2 is a side elevation of Fig. 1.

Fig. 3 is a fragmentary view of Fig. 1 taken in the direction of the arrow "A".

Fig. 4 is a fragmentary view of Fig. 1 taken in the direction of the arrow "B" and

Fig. 5 shows a disc brake for a motor

vehicle provided with a hand brake constructed in accordance with another embodiment of the invention.

In the embodiment of the present invention shown in Figs. 1 to 4 the brake comprises an annular disc 1 provided at its inner periphery with an axially-extending cylindrical member 2 which in turn is provided at one end with an inwardly-extending annular flange 3 which is adapted to be secured to a rotatable part of a vehicle wheel assembly whereby the disc is rotatable with the wheel. A non-rotatable housing 4 straddles a part only of the outer periphery of said disc and accommodates a plurality of fluid pressure operated piston and cylinder mechanisms 5, each of which is adapted to force a pad of friction material in frictional engagement against the radially-extending sides of the disc and thus brake the wheel. This brake arrangement has been more fully described in our co-pending Application No. 1908/50 (Patent Specification No. 688,382).

The brake is provided, at its outer periphery, with a circumferentially-extending groove 6 of rectangular section. A thin flexible metal band 7 encircles the outer periphery of the disc, one end thereof being secured to a pin 8 located at one end of the brake housing. A flexible strip of friction material 9 is secured 35 to the inside of the band, the length of the strip being of the order of three quarters of the periphery of the disc. The strip of friction material fits in the annular groove in the periphery of the disc and is restrained from any tendency towards axial movement by the sides of the groove.

A bifurcated bracket 10 is secured to the end of the housing remote from the pin 8 by nut and bolt means 11. The bracket is provided with a spindle 12 extending therethrough. Rotatably mounted on said spindle and between the arms of the bracket is a sleeve 12a, one end thereof being integral with one end of a bell-crank lever 13. Integral with the other end of said spindle is a lever terminating in a hook arrangement 14 which engages in a loop 15 formed in the end of the flexible band remote from the anchored end. The end of the bell-crank lever 13 remote from the sleeve is adapted to be connected to a cable and hand-lever arrangement of known type.

To apply the hand-brake the hand lever is angularly moved and the cable tensioned. This in turn displaces the bell-crank lever to rotate the sleeve. Rotation of the sleeve imparts an angular movement to the lever and hook arrangement

which tensions the flexible band and forces the strip of friction material associated therewith into frictional engagement with the outer periphery of the disc, thus braking the wheel. 70

The disc may alternatively be provided with a V-shaped peripheral groove, and the flexible strip of friction material may be of complementary section. Alternatively the flexible band and strip of friction material may be associated with the cylindrical member 2 of the brake disc.

In another embodiment of the invention, shown in Fig. 5 of the accompanying drawings, a hydraulically-operated disc brake is provided for a motor vehicle said brake being of the type briefly described above and more fully described in our co-pending Application No. 1908/50 85 (Patent Specification No. 688,382).

A substantially triangular brake shoe 16, radially in line with the periphery of the disc and having approximately the same thickness, is pivotally secured to one end of the non-rotatable brake housing. One side of the shoe lies adjacent the periphery of the disc, which is not provided with a groove as in the previous embodiment. This side is curved to the 95 periphery of the disc and is provided with a similarly curved pad of friction material 17 to frictionally engage the periphery of the disc. The friction material covers approximately one eighth 100 of the periphery of the disc. An adjacent side of the shoe is provided with a lug 18 whereby the shoe is pivotally secured to the brake housing, and this is also provided with a recess. Into this recess is 105 fitted a cam 19 one side of which abuts the recessed side of the shoe, and the other side abuts the adjacent end of the housing. The cam is secured to a spindle 20 which is rotatably fitted through lugs 21 110 extending from the end of the housing. A lever 22 is secured at one end to the spindle by a nut 23, whereby angular movement of the lever rotates the spindle. The end of the lever is adapted for connection to a cable and hand brake arrangement of known type.

To apply the hand brake the hand lever is angularly moved and the cable is tensioned. This angularly moves the lever 120 22 to rotate the spindle and also the cam associated therewith. Rotation of the cam pivots the shoe about its fulcrum, to force the pad of friction material in frictional engagement against the periphery 125 of the disc.

The hand brakes of the present invention need not necessarily be associated with a disc brake of the type described but are applicable to any vehicle brak-

comprising a disc rotatable by a vehicle wheel.

What we claim is:—

- 5 1. A hand brake for a vehicle disc brake comprising a brake disc rotatable with a wheel, non-rotatable friction material to frictionally engage the periphery of said disc and manual means for effecting said engagement. 30
- 10 2. A hand lever according to claim 1 wherein the friction material comprises a flexible strip encircling the periphery of the disc. 35
- 15 3. A hand lever according to claim 2 wherein the flexible strip of friction material is secured to a flexible band having one end non-rotatably secured and the other end associated with said means for effecting frictional engagement. 40
- 20 4. A hand brake according to claim 3 wherein said means for effecting frictional engagement comprises a lever mechanism having one end adapted to be secured to a brake applying means and the other end attached to the free end of the flexible band, whereby angular move- 45
- 25 ment of said lever mechanism tightens the band and forces the associated strip of frictional material into frictional engagement with the periphery of the disc. 50
- 30 5. A hand brake according to any of the preceding claims wherein the periphery of the brake disc is provided with a groove to accommodate the strip of friction material. 55
- 35 6. A hand brake according to claim 1 wherein the frictional material is secured to a pivotally mounted shoe and wherein the means for effecting frictional engagement comprises a lever and cam arrangement. 60
- 40 7. A hand brake for a vehicle disc brake constructed and arranged substantially as described herein and illustrated in Figs. 1—4 of the accompanying drawings. 65
- 45 8. A hand brake for a vehicle disc brake constructed and arranged substantially as described herein and illustrated in Fig. 5 of the accompanying drawings. 70

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Agent for the Applicants.

PROVISIONAL SPECIFICATION
No. 175,83, A.D. 1951.

Motor Vehicle Combined Disc and Hand Brake

50 We, DUNLOP RUBBER COMPANY LIMITED, a British Company, of 1, Albany Street, London, N.W.1, and HENRY JAMES BUTLER, a British Subject, of the Dunlop Rim and Wheel Company Limited, Foleshill, Coventry, do hereby declare this invention to be described in the following statement:—

This invention relates to vehicle brakes, and more particularly to hand brake arrangements for motor vehicle brakes of the disc type.

It is a requirement for motor vehicles that at least one pair of wheels shall be provided with mechanically applied brakes which are independent of the normal braking system. Such brakes are normally operated through a hand lever and cable or linkage, and means are provided whereby the brakes can be maintained in the applied position when the vehicle is stationary and unattended. The hand brakes may also be applied as an alternative to the normal braking system, should the said system fail during service.

75 Present hand brake arrangements are satisfactory when applied to the conventional drum brake, but cannot easily be applied to disc brakes, for instance disc brakes comprising a disc rotatable with a wheel, a non-rotatable housing straddling a part only of the outer periphery of said disc, pads of friction material to frictionally engage the radi-

all extending sides of the disc and a plurality of fluid pressure operated piston 85 and cylinder mechanisms to effect said engagement. Such a disc brake is more fully described in our co-pending Application No. 1908/50.

The object of the present invention is 90 to provide a hand brake arrangement suitable for motor vehicle brakes of the disc type.

According to the invention a hand brake comprises a rotatable braking member, a flexible band, a strip of friction material associated therewith to frictionally engage a periphery of said member and means to effect said engagement. Preferably the braking member is a disc 100 and the flexible band encircles the outer periphery of the disc, having one end rigidly anchored and the other end associated with a toggle arrangement whereby, on applying the hand brake, the 105 band can be tensioned around the disc. A strip of friction material is secured to the inside of the band to frictionally engage the outer periphery of the disc as the band is tensioned. 110

In one embodiment of the invention a disc brake for a motor-vehicle comprises an annular disc provided on its inner peripheral edge with an axially extending cylindrical member which in turn is provided at one end with an inwardly extending annular flange, and said flange is 115

- secured to a rotatable part of a vehicle wheel assembly whereby the disc is rotatable with the wheel. A non-rotatable housing straddles a part only of the outer periphery of said disc and accommodates a plurality of fluid-pressure operated piston and cylinder mechanisms each of which is adapted to force a pad of friction material in frictional engagement 5 against the radially extending sides of the disc, and thus brake the wheel. This brake arrangement has been more fully described in our co-pending Application No. 1908/50.
- 15 The hand brake device comprises a brake band around the outer periphery of the disc tightened by a toggle which is in turn operated by a conventional arrangement of hand brake lever and cable.
- 20 The brake disc is provided, at its outer periphery, with a circumferentially extending groove of rectangular section. The flexible band encircles the outer periphery of the disc and one end thereof is anchored to a lug thrown off the brake housing and a flexible strip of friction material is secured to the inside of the band, the length of the strip being substantially three quarters of the periphery 25 of the disc. The strip of friction material fits in the annular groove in the periphery of the disc, and is restrained from any tendency towards axial movement by the sides of the groove.
- 30 35 A sleeve is rigidly secured to the end of the housing remote from the anchored end of the strip, said sleeve being radially extending and parallel to a braking surface of the disc, and spaced a short distance away therefrom. A spindle is 40 rotatably fitted in said sleeve, the end of the spindle adjacent the centre of the disc having secured thereto one end of an arm of a bell-crank lever. Said arm extends 45 substantially axially away from the end

of the spindle and the disc and terminates in another arm substantially at right angles thereto the end of which is located adjacent one side of the housing. The end of said latter arm is adapted to be connected to a hand-lever and cable arrangement of known type.

The other end of the spindle is provided with a lever which terminates in a hook arrangement which engages in a loop formed in the end of the flexible band remote from the anchored end.

To apply the hand brake the hand-lever is angularly moved and the cable tensioned. This in turn displaces the bell-crank lever to rotate the spindle in its sleeve, and rotation of the spindle imparts an angular movement to the lever and brake arrangement which tensions the flexible band and forces the strip of friction material associated therewith in frictional engagement against the outer periphery of the disc, hence braking the wheel.

Preferably the brake is so arranged that the rotation of the disc, in a normal forward direction of the vehicle, tends to wrap the flexible band and strip of friction material more closely around the periphery thereof, thus providing a slight servo-effect.

This disc may conveniently be provided with a V-sectioned peripheral groove, and the flexible strip of friction material may be of complementary section. Alternatively the flexible band and strip of friction material may be associated with the cylindrical member of the brake disc, or, in yet a further embodiment of the invention the hand brake arrangement is applied to the outer periphery of a drum provided with outwardly expanding brake shoes.

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PROVISIONAL SPECIFICATION
No. 19650, A.D. 1951.

Motor Vehicle Combined Disc and Hand Brake

We, DUNLOP RUBBER COMPANY LIMITED, 90 a British Company, of 1, Albany Street, London, N.W.1, and HENRY JAMES BUTLER, a British Subject, of the Dunlop Rim and Wheel Company Limited, Foleshill, Coventry, do hereby declare this 95 invention to be described in the following statement:—

This invention relates to hand brakes for vehicles, and more particularly to hand brakes for road vehicles fitted with disc-type brakes.

It is obligatory to fit hand brakes on road vehicle wheels which can be applied independently of the normal applying

means, which normally comprises a hydraulic system. Conventional vehicle 105 braking systems comprise a drum rotatable with a wheel, and non-rotatable arcuate brake shoes within the drum adapted to move outwardly under the action of hydraulically-operated mechanisms to frictionally engage the inner walls of the drum. In such braking systems the hand brake normally comprises a hand lever under the control of the driver of the vehicle, a cable actuated 110 by the hand lever and a cam arrangement operated by the cable to move the brake shoes into frictional engagement

with the drum independently of the hydraulic system.

This hand brake arrangement is satisfactory when applied to the conventional 5 drum brake, but it is not practicable to apply it to a vehicle braking system comprising an annular disc rotatably secured to a vehicle wheel, a non-rotatable housing straddling the outer periphery of a portion 10 only of said annular disc, pads of friction material axially slidably in said housing to frictionally engage the radially-extending sides of said disc and fluid pressure operated mechanisms to effect 15 said engagement. Such a disc brake arrangement has been more fully described in our co-pending Application No. 1908/50.

The object of the present invention is 20 to provide a hand brake for a motor vehicle disc brake, particularly a disc brake of the type described in said co-pending Application No. 1908/50.

According to the present invention a 25 hand brake for a disc brake comprises a brake disc rotatable with a wheel, a pad of friction material to frictionally engage the periphery of said disc and means for effecting said engagement.

30 Preferably the disc brake comprises an annular disc rotatable with a vehicle wheel, a non-rotatable housing straddling a portion of said disc, pads of friction material slidably associated with said 35 housing to frictionally engage said disc and fluid pressure operated mechanisms to effect said engagement. The hand brake arrangement comprises a pad of friction material pivotally associated with said 40 housing to frictionally engage the outer periphery of said disc, and a cable operated cranked lever to effect said engagement.

In one embodiment of the invention a 45 hand brake arrangement for a motor vehicle wheel brake comprises an annular disc having a cylindrical member extending axially from the inner periphery thereof and an annular flange extending 50 radially inwardly from the end of said member. Said flange is adapted to be removably secured to a rotatable part of the vehicle wheel assembly, e.g. the hub.

A caliper-type housing straddles a portion 55 only of the outer periphery of the disc and is secured to a non-rotatable portion of the wheel assembly. The two limbs of the housing are each provided with a plurality of axially extending 60 fluid-pressure operated piston and cylinder mechanisms, each mechanism being adapted to force a pad of friction material into frictional engagement with the radially extending surfaces of the 65 disc. This construction has been more

fully described in our co-pending Application No. 1908/50.

The axially-extending part of the housing which lies adjacent the periphery of the disc and joins the two limbs is provided with a radial hole extending therethrough. Two lugs extend outwardly from the housing, one on each side of said hole, and said lugs are parallel with one another. A cranked lever is pivotally 70 secured, adjacent one end, to a pin extending between said lugs, one end of said lever being adapted to be secured to a cable operated by a hand lever, and the other end being recessed to accommodate 80 one end of a swivel-pin. A cylindrical pad of friction material is slidably fitted in the hole in the housing, one face thereof being adapted to frictionally engage the outer periphery of said disc. 85 A plunger is also slidably fitted in said hole, one face thereof abutting the friction pad and the other face being provided with a recess to accommodate the other end of the swivel-pin. 90

The operation of the hand brake is as follows:—

On applying the hand lever the cable is tensioned to move the cranked lever into such an angular position that the end 95 associated with the swivel-pin is moved towards the housing. The swivel-pin, which is fitted between the end of the lever and the plunger, forces the plunger inwardly towards the disc, in turn forcing the pad of friction material in frictional engagement against the outer periphery of the disc. 100

On releasing the hand lever the tension in the cable is relaxed and the brake pad 105 only lightly engages the outer periphery of the disc, thus substantially removing the braking pressure.

In another embodiment of the invention a hand brake arrangement for a 110 motor vehicle disc brake comprises a disc brake of the type referred to above and more fully described in our co-pending Application No. 1908/50. A lug extends substantially tangentially from one end 115 of the housing, between the two limbs thereof and from the end of said lug a pin extends towards the disc and parallel with a radially extending surface thereof.

A cranked lever pivots about said pin, 120 one end thereof being adapted to be connected to the cable operated by the hand-lever. The other end of the lever has secured thereto a backing member for a wedge-shaped pad of friction material, 125 one face of which is adapted to frictionally engage the outer periphery of the disc, and the other face of which is slidably fitted against a cut out part of the housing between the limbs thereof. 130

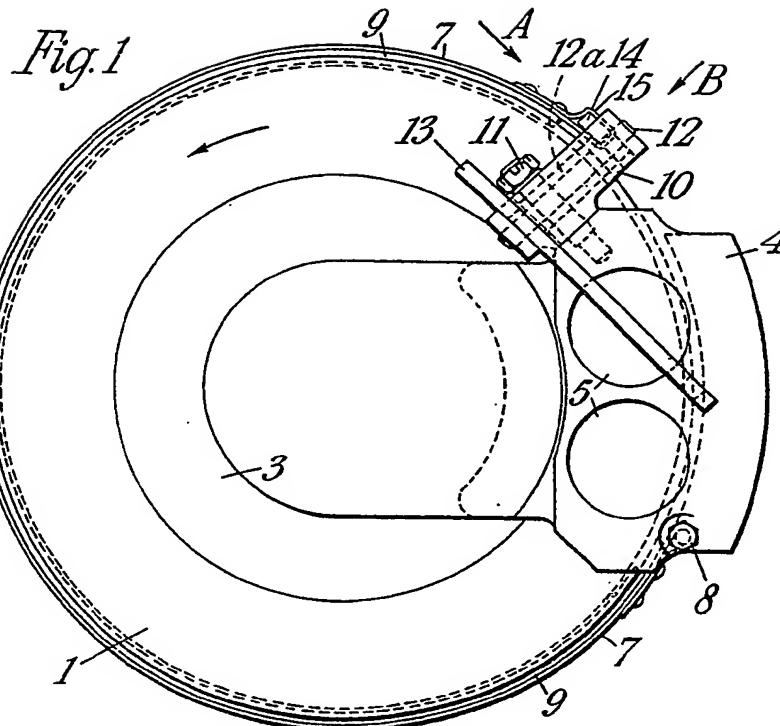
- The brake is operated, as in the previous example, by tensioning the cable secured to one end of the cranked lever, and thereby angularly moving the lever.
- 5 The backing member forces the pad of friction material in frictional engagement against the periphery of the disc. Preferably the pad of friction material is located on that side of the brake caliper 10 so that rotation of the disc in a rearward movement of the vehicle will tend to increase the wedging of the friction pad and thus impart a servo-effect to the brake.
- 15 In yet another embodiment of the invention a hand brake arrangement for a motor vehicle disc brake comprises a substantially triangular member pivotally secured at one apex to a bifurcated 20 lug thrown off one side of the housing between the two limbs thereof. One side of the member is located adjacent the periphery of the disc and is radiussed to be concentric with said periphery. A

curved pad of friction material is secured 25 thereto to frictionally engage the periphery of the disc. One end of a cranked lever is fitted between the side of the housing and the side of the member adjacent thereto, the other end of the 30 lever being adapted to be connected to one end of the cable. Thus on tensioning the cable the cranked lever is angularly moved to force the adjacent sides of the member and housing apart, in turn causing the member to pivot so that the friction pad frictionally engages the outer periphery of the disc.

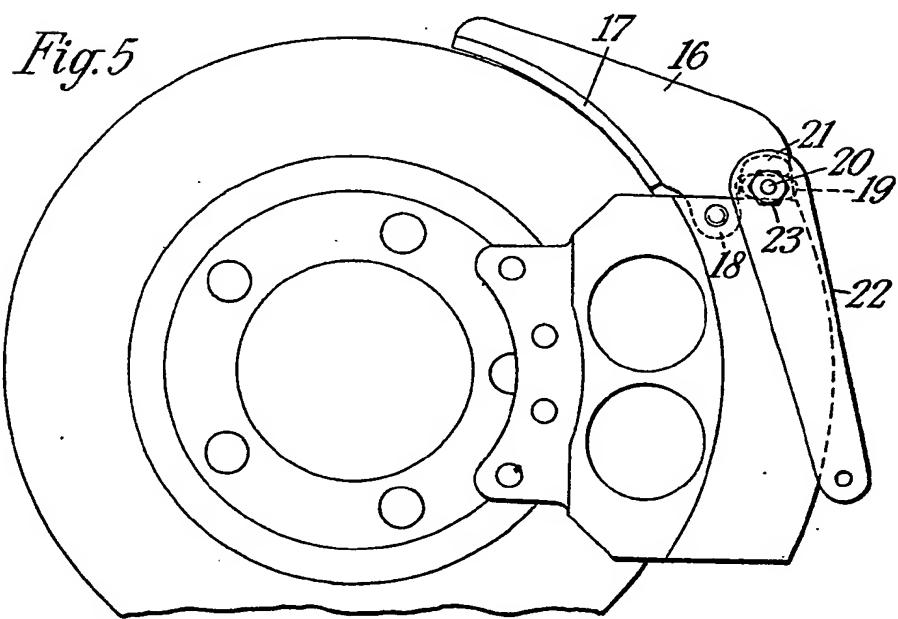
The hand brake of the present invention, wherein means are provided for frictionally engaging the outer periphery of a brake disc, may be applied to disc brake construction other than those described in our co-pending Application No. 1908/50, and to multi-disc brakes for vehicles 45 other than motor vehicles.

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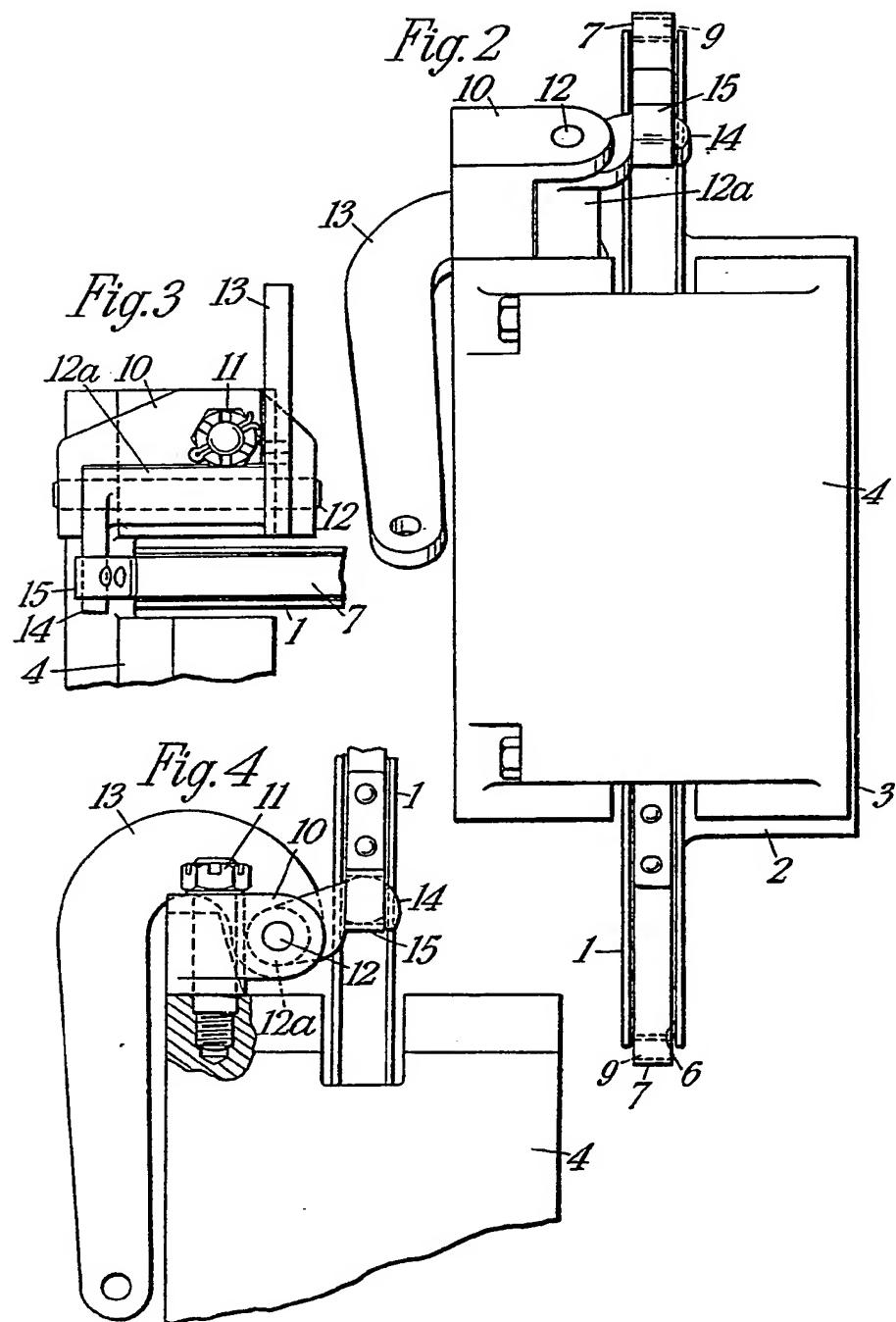


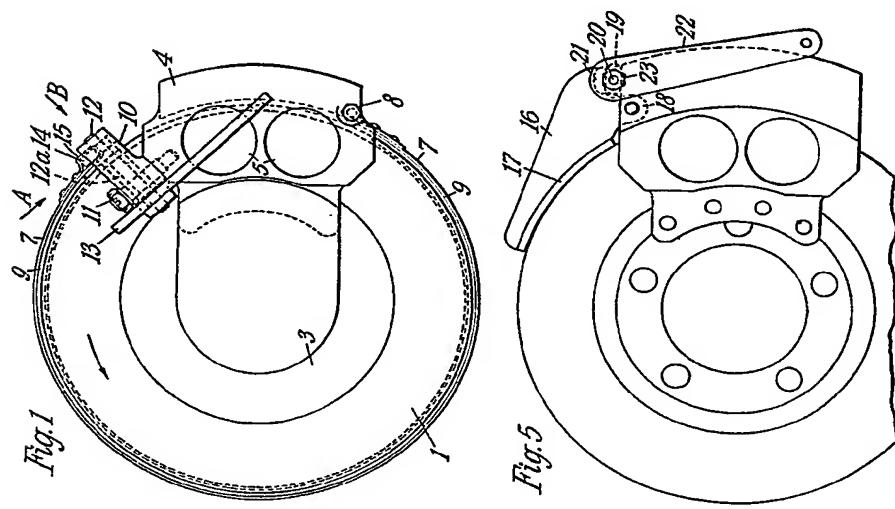
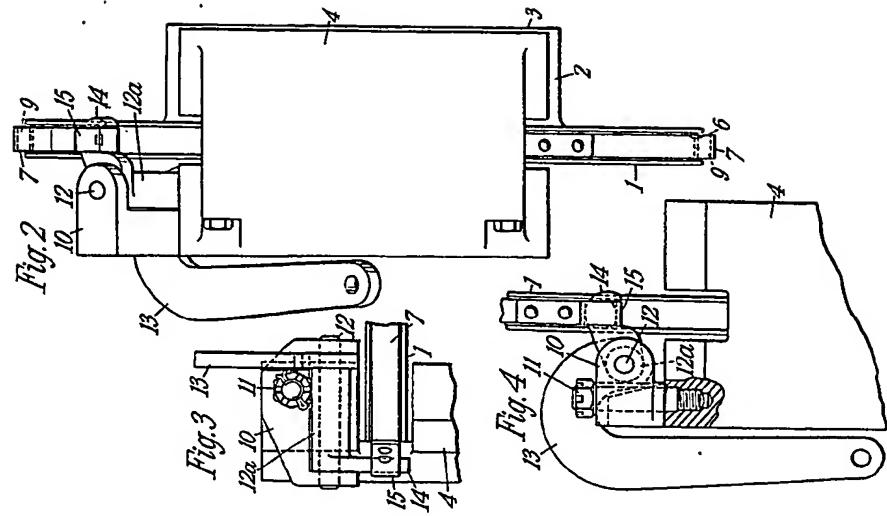
706,640 COMPLETE SPECIFICATION

2 SHEETS

*This drawing is a reproduction of
the Original on a reduced scale.*

SHEETS 1 & 2





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